AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A droplet ejection apparatus comprising:

a plurality of droplet ejection heads, each of the droplet ejection heads including:

a diaphragm;

an actuator which displaces the diaphragm;

a cavity filled with a liquid, an internal pressure of the cavity being increased and decreased in response to displacement of the diaphragm; and

a nozzle communicated with the cavity, through which the liquid is ejected in the form of droplets in response to the increase and decrease of the internal pressure of the cavity;

a driving circuit which drives the actuator of each droplet ejection head;

pulse generating means for generating reference pulses;

a counter for counting a number of reference pulses generated for a predetermined time period;

ejection failure detecting means for detecting an ejection failure of the droplets on the basis of a count value of the counter counted for the predetermined time period; and

switching means for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out a droplet ejection operation by driving the actuator;

wherein the ejection failure detecting means detects presence or absence of the ejection failure by comparing a normal count range of the reference pulses when a droplet is normally ejected by the driving of the actuator with a count value of the counter counted for the predetermined time period.

2. (Previously Presented) The droplet ejection apparatus as claimed in claim 1, wherein the predetermined time period is a time period until a residual vibration of the diaphragm displaced by the actuator is generated after a droplet has been normally ejected from the droplet ejection head.

3. (Previously Presented) The droplet ejection apparatus as claimed in claim 1, wherein the predetermined time period is a time period corresponding to a first half cycle of a residual vibration.

4. (Previously Presented) The droplet ejection apparatus as claimed in claim 1, wherein the predetermined time period is a time period corresponding to a first one cycle of a residual vibration.

5. (Cancelled).

6. (Currently Amended) The droplet ejection apparatus as claimed in ~~claim 5~~ claim 1, wherein the ejection failure detecting means judges that an air bubble

has been intruded into the cavity as a cause of the ejection failure in the case where the count value is smaller than the normal count range.

7. (Currently Amended) The droplet ejection apparatus as claimed in ~~claim 5~~ claim 1, wherein the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying or that paper dust is adhering in the vicinity of an outlet of the nozzle as a cause of the ejection failure in the case where the count value is larger than the normal count range.

8. (Currently Amended) ~~The droplet ejection apparatus as claimed in claim 1,~~ A droplet ejection apparatus comprising:

a plurality of droplet ejection heads, each of the droplet ejection heads including:

a diaphragm;

an actuator which displaces the diaphragm;

a cavity filled with a liquid, an internal pressure of the cavity being increased and decreased in response to displacement of the diaphragm; and

a nozzle communicated with the cavity, through which the liquid is ejected in the form of droplets in response to the increase and decrease of the internal pressure of the cavity;

a driving circuit which drives the actuator of each droplet ejection head;

pulse generating means for generating reference pulses;

a counter for counting a number of reference pulses generated for a predetermined time period;

ejection failure detecting means for detecting an ejection failure of the droplets on the basis of a count value of the counter counted for the predetermined time period; and

switching means for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out a droplet ejection operation by driving the actuator;

wherein the counter subtracts the number of reference pulses counted for the predetermined time period from a predetermined reference value, and the ejection failure detecting means detects the ejection failure on the basis of a subtraction result.

9. (Original) The droplet ejection apparatus as claimed in claim 8, wherein the ejection failure detecting means judges that an air bubble has intruded into the cavity as a cause of the ejection failure in the case where the subtraction result is smaller than a first threshold.

10. (Original) The droplet ejection apparatus as claimed in claim 8, wherein the ejection failure detecting means judges that the liquid in the vicinity of the nozzle has thickened due to drying as a cause of the ejection failure in the case where the subtraction result is larger than a second threshold.

11. (Original) The droplet ejection apparatus as claimed in claim 10, wherein the ejection failure detecting means judges that paper dust is adhering in the

vicinity of the outlet of the nozzle as a cause of the ejection failure in the case where the subtraction result is smaller than the second threshold and larger than a third threshold.

12. (Previously Presented) The droplet ejection apparatus as claimed in claim 1, further comprising storage means for storing a detection result detected by the ejection failure detecting means.

13. (Cancelled)

14. (Previously Presented) The droplet ejection apparatus as claimed in claim 1, wherein the ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with a residual vibration of the diaphragm.

15. (Original) The droplet ejection apparatus as claimed in claim 14, wherein the ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element.

16. (Original) The droplet ejection apparatus as claimed in claim 14, wherein the ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm

from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit.

17. (Original) The droplet ejection apparatus as claimed in claim 16, wherein the ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform.

18. (Original) The droplet ejection apparatus as claimed in claim 17, wherein the waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value; and

wherein the comparator generates and outputs a rectangular wave based on this voltage comparison.

19. (Original) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes an electrostatic actuator.

20. (Original) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element.

21. (Original) The droplet ejection apparatus as claimed in claim 1, wherein the droplet ejection apparatus includes an ink jet printer.

22. – 27. (Cancelled)